



Technical data

2300 kWel, 400 V, 50 Hz, Natural gas, MN = 80

Design conditions

Inlet air temperature / rel. Humidity:	[°C] / [%]	35 / 60
Altitude:	[m]	100
Exhaust temp. after heat exchanger:	[°C]	120
NOx raw emissions genset (tolerance -8 %):	[mg/Nm ³ @5% O ₂]	500

Fuel gas data: ¹⁾

Methane number:	[-]	80
Lower calorific value:	[kWh/Nm ³]	10,17
Gas density:	[kg/Nm ³]	0,79
Standard gas: Natural gas, MN = 80		

Genset:

Engine / Configuration code:	CG170B-20	R
Speed / Mean piston speed:	[1/min] / [m/s]	1500 / 9,8
Configuration / number of cylinders:	[-]	V / 20
Bore / Stroke / Displacement:	[mm] / [mm] / [dm ³]	170 / 195 / 88,5
Compression ratio:	[-]	13,0
Mean effective pressure:	[bar]	21,3
Mean lube oil consumption at full load:	[g/kWh]	0,15
Generator:	Leroy-Somer LSA 53.2 M12 or similar (*)	
Voltage / voltage range / cos Phi:	[V] / [%] / [-]	400 / 10 / 1,00
Speed / frequency:	[1/min] / [Hz]	1500 / 50

*CES reserves the right to change the alternator supplier and type during offer period. The genset data may thereby change slightly. The power output will not change. CES will confirm the alternator type, brand and alternator data sheet with the order confirmation.

Energy balance

Load:	[%]	100	75	50
Electrical power COP acc. ISO 8528-1:	[kW]	2300	1725	1150
Engine jacket water heat:	[kW ±8%]	1306	953	671
Intercooler LT heat:	[kW ±8%]	168	127	75
Lube oil heat:	[kW ±8%]			
Exhaust heat with temp. after heat exchanger:	[kW ±8%]	1032	862	670
Exhaust temperature:	[°C ±25°C]	397	428	466
Exhaust mass flow wet / dry:	[kg/h]	12382 / 11278	9254 / 8414	6361 / 5773
Combustion mass air flow:	[kg/h]	11973	8941	6141
Radiation heat engine / generator:	[kW ±8%]	70 / 61	65 / 46	60 / 35
Fuel consumption:	[kW+5%]	5242	4006	2819
Electrical / thermal efficiency:	[%]	43,9 / 44,6	43,1 / 45,3	40,8 / 47,6
Total efficiency:	[%]	88,5	88,4	88,4

System parameters ²⁾

Ventilation air flow (comb. air incl.) with ΔT = 15K	[kg/h]	55600
Combustion air temperature minimum / design:	[°C]	5 / 35
Exhaust back pressure from / to:	[mbar]	30 / 50
Exhaust volume flow wet / dry:	[Nm ³ /h]	9584 / 8553
Maximum pressure loss in front of air cleaner:	[mbar]	5
Zero-pressure gas control unit selectable from / to: ¹⁾	[mbar]	20 ³⁾ / 200
Pre-pressure gas control unit selectable from / to: ¹⁾	[bar]	0,5 / 10
Starter battery 24V, capacity required:	[Ah]	430
Starter motor:	[kWel.] / [VDC]	18 / 24
Lube oil content engine / base frame ⁴⁾ :	[dm ³]	300 / 685
Dry weight engine / genset:	[kg]	8170 / 17790

Cooling system

Glycol content engine jacket water / intercooler:	[% Vol.]	33 / 33
Water volume engine jacket / intercooler:	[dm ³]	210 / 22
KVS / Cv value engine jacket water / intercooler:	[m ³ /h]	47,3 / 58,3
Jacket water coolant temperature in / out:	[°C]	78 / 93
Intercooler coolant temperature in / out:	[°C]	45 / 49
Engine jacket water flow rate from / to:	[m ³ /h]	60 / 85
Water flow rate engine jacket water / intercooler:	[m ³ /h]	80 / 40
Water pressure loss engine jacket water / intercooler:	[bar]	2,8 / 0,5
Engine jacket water pressure outlet min / max:	[bar rel.]	2,2 / 2,5

Notes:

- 1) See also Techn. Circular 0199-99-3017
- 2) See also "Layout of power plants"
- 3) Minimum pressure may be higher, depending on project conditions.
- 4) optional
- 5) DIN EN ISO 9614-2 (s±4 dB)
- 6) Measured in exhaust pipe (f ≤ 250Hz: ±5dB f > 250Hz: ±3dB)
- 7) DIN 45635-11, Appendix A

Sound data

S33032473EB2891712
62829

Frequency band	25	31,5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k	12.5k	16k	L _{WA}	S
f [Hz]																														[dB(A)]	[m ²]
Air-borne noise ⁵⁾	94,8	96,1	97,4	101	103,7	107,3	112,7	118,9	115,5	115,3	112,7	110,8	112,1	111,5	108,8	108,6	109,3	108,5	108,2	108,8	106,4	104,8	103,8	102,9	106,1	116,7	104,3			121,0	117,3
L _{W,Third} [dB(lin)]																														±4dB(A)	
Exhaust noise ⁶⁾	117,7	117,3	120	124	125,4	126,5	130,7	142,5	127,4	126,7	131	125,5	125,2	125,6	126,4	125,1	124,5	123,8	124,3	124	122,7	122,3	119,8	118,5	116,8	115,4	115,2	113,1	110,7	135,6	15,5 ⁷⁾
L _{W,Third} [dB(lin)]																														±3dB(A)	

L_W: Sound power level

S: Area of measurement surface (S₀=1m²)

Technical data

2300 kWel, 400 V, 50 Hz, Natural gas, MN = 80

Design conditions

Inlet air temperature / rel. Humidity:	[°C] / [%]	35 / 60
Altitude:	[m]	100
Exhaust temp. after heat exchanger:	[°C]	120
NOx raw emissions genset (tolerance -8 %):	[mg/Nm ³ @5% O ₂]	500

Minimum loads ⁸⁾

Minimum electrical load for short-term operation:	[kW]	700
Recommended minimum electrical load for continuous operation:	[kW]	1150

Notes for derating ⁹⁾

		inlet air temperature		max. inlet air temperature		
		+ 5 K	+ 10 K	w/o power derating	grid parallel mode ¹⁰⁾	island mode ¹¹⁾
inlet air temperature	[°C]	40	no rating	40	40	40
Load:	[%]	100		100	100	100
Electrical power COP acc. ISO 8528-1:	[kW]	2300		2300	2300	2300
Electrical / thermal efficiency:	[%]	43,8 / 44,9		43,8 / 44,9	43,8 / 44,9	43,8 / 44,9
Total efficiency:	[%]	88,7		88,7	88,7	88,7
Intercooler coolant temperature in / out:	[°C]	45 / 49		45 / 49	45 / 49	45 / 49

Methane number sensitivity: ¹²⁾

		Methane number:			Minimum MN for full load
		design	-5	-10	
Methane number:		80	75	70	76
Load:	[%]	100	99	92	
Intercooler coolant temperature in / out:	[°C]	45	45	45	
Electrical power COP acc. ISO 8528-1:	[kW]	2300	2275	2113	

Exhaust emission data at engine out ^{13), 14)}

Electrical power COP acc. ISO 8528-1:	[kW]	2300
NO _x (as NO ₂), dry	[g/Nm ³ @5% O ₂]	0,50
CO, dry	[g/Nm ³ @5% O ₂]	0,78
THC, dry ¹⁵⁾	[g/Nm ³ @5% O ₂]	0,84
NMHC, dry ^{15), 16)}	[g/Nm ³ @5% O ₂]	0,05
NMNEHC, dry ^{15), 16)}	[g/Nm ³ @5% O ₂]	0,02
HCHO (Formaldehyde), dry	[g/Nm ³ @5% O ₂]	0,14
CH ₄ , dry ^{15), 16)}	[g/Nm ³ @5% O ₂]	0,79
Exhaust mass flow CO ₂ [2]:	[kg/h +5%]	1061
CO ₂ , dry	[%]	6,3
O ₂ , dry	[%]	9,9

Notes:

8) See "Layout of power plants" ch. 4.4

9) The derate information shown does not take into account external cooling system capacity. It assumes that external cooling systems can maintain the specified cooling water temperatures at site conditions.

10) ISO 8528-1:2005-06, 6.3.1 b)

11) ISO 8528-1:2005-06, 6.3.1 a)

17) To maintain a constant air-fuel-mixture inlet manifold temperature, as the inlet air temperature goes up, so must the heat rejection. The listed aftercooler coolant temperatures have been increased considering a limited capacity of the heat exchange circuit to reject heat to the atmosphere. Non standard applications, e.g. use of cooling towers are hereby not considered.

12) Deviation in fuel consumption possible. No statement for MN < 70 since control parameters may have to be changed.

13) At engine exhaust flange prior to any aftertreatment. CO, Total Carbon, NMHC, NMNEHC and HCHO are the maximum values expected under steady state conditions.

14) Particles below 10 ppm.

15) Calculated with the density of C

16) The THC composition depends on the composition of hydrocarbons in the fuel gas.

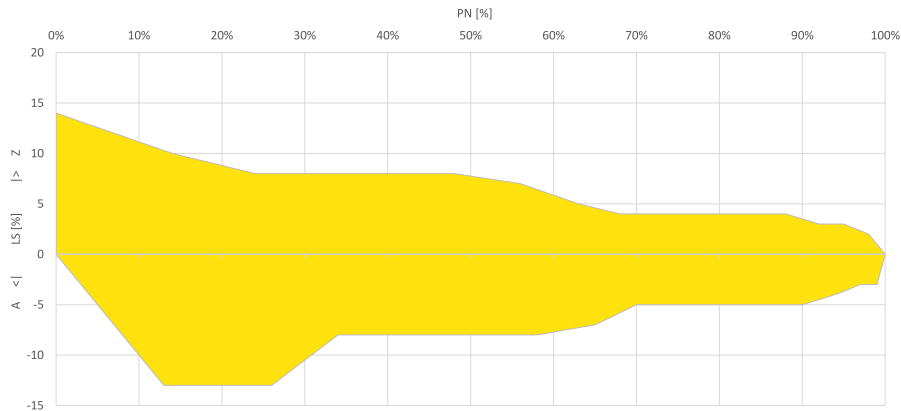
Technical data

2300 kWel, 400 V, 50 Hz, Natural gas, MN = 80

Design conditions

Inlet air temperature / rel. Humidity:	[°C] / [%]	35 / 60
Altitude:	[m]	100
Exhaust temp. after heat exchanger:	[°C]	120
NOx raw emissions genset (tolerance -8 %):	[mg/Nm ³ @5% O ₂]	500
Generator inertia:	[kg m ²]	0
Engine control system:	[-]	

Loadstep information



Transient Capability
A Load acceptance
R Load rejection
PN [%] Actual power in percent, in relation to rated power
LS [%] Maximum permissible load acceptance and rejection in percent, in relation to rated power

Loadstep capability								
Start load / maximum step [% / %]	Load acceptance			Load rejection			Minimum number required steps	
0 / 14	76 / 4			100 / -3	50 / -8		Load acceptance	[-] 17
14 / 10	80 / 4			97 / -3	42 / -8		Load rejection	[-] 15
24 / 8	84 / 4			94 / -4	34 / -8		Wait times	
32 / 8	88 / 4			90 / -5	26 / -13		Load acceptance	[s] 40
40 / 8	92 / 3			85 / -5	13 / -13		Load rejection	[s] 40
48 / 8	95 / 3			80 / -5	0 / 0			
56 / 7	98 / 2			75 / -5				
63 / 5	100 / 0			70 / -5				
68 / 4				65 / -7				
72 / 4				58 / -8				

Notes

- The transient load steps listed above are stated as a percentage of the genset's rated power as indicated in the appropriate performance technical data sheet for the operational conditions in focus.
- Transient performance data is representative of a hot engine / genset (previously loaded or fully pre-heated).
- Genset is capable to be unloaded to 0 % load from any loaded condition and will remain running unloaded at the rated synchronous speed.
- The control system requires a minimum wait time to converge after each load step to return to an acceptable band to nominal setting. If the wait time is not met between load steps the transient performance listed in the document may not be met.
- Engine governor gains and Voltage regulator settings may need to be tuned for the site conditions.
- Gensets must be maintained and operated in accordance to specific guidelines and documents in the relevant version (service manuals, Technical Circular 2172, Power plants layout etc.) applicable to each genset.
- The transient capability stated above is a result of simulative analysis and calculations based on the tested capability at ISO conditions. The defined capability is valid for stated frequency and voltage deviation in ISO 8528-5 for G1 class with exceptions. No validation for specific site and boundary conditions has been conducted.